

ENVIRONMENTAL CHAMBER STUDIES OF VOC SPECIES IN ARCHITECTURAL COATINGS AND MOBILE SOURCE EMISSIONS

South Coast Air Quality Management District
Contract No. 03468

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Funding Level \$199,547

June 1, 2003 – May 31, 2004

Outline

- Objectives
- Current Status
- Candidate VOCs for study

OBJECTIVES

Ambient Surrogate – NO_x Evaluation Experiments

- Evaluate "Base Case" for reactivity studies
- Evaluate mobile source emission reactivity

Environmental chamber studies of architectural coatings VOCs

- Supplement CARB project
- Funding for at least 3 types of VOCs
- Probable focus on glycols or other VOCs relevant to water-based coatings

Obtain PM formation data in conjunction with these and the CARB reactivity experiments

- PM measurements with reactivity runs involve relatively small incremental cost
- Supplemental EPA earmark funding will cover needed PM characterization work

Evaluate potential utility of UCR EPA chamber for "availability" studies

CURRENT STATUS

Ambient surrogate evaluation

- Experiments will be determined after analysis of results of extensive series of surrogate experiments from EPA OBM study.

Chamber Studies of Architectural Coatings VOCs

- Candidate compounds will be discussed at RRAC meeting
- Initial experiments will use same base case as used for petroleum distillates for CARB project

PM Formation Data

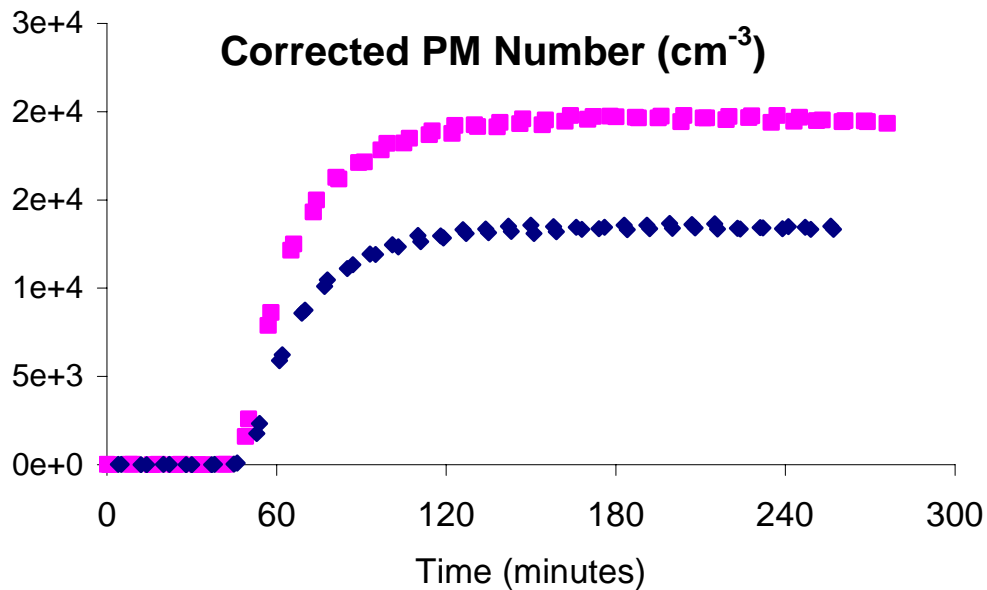
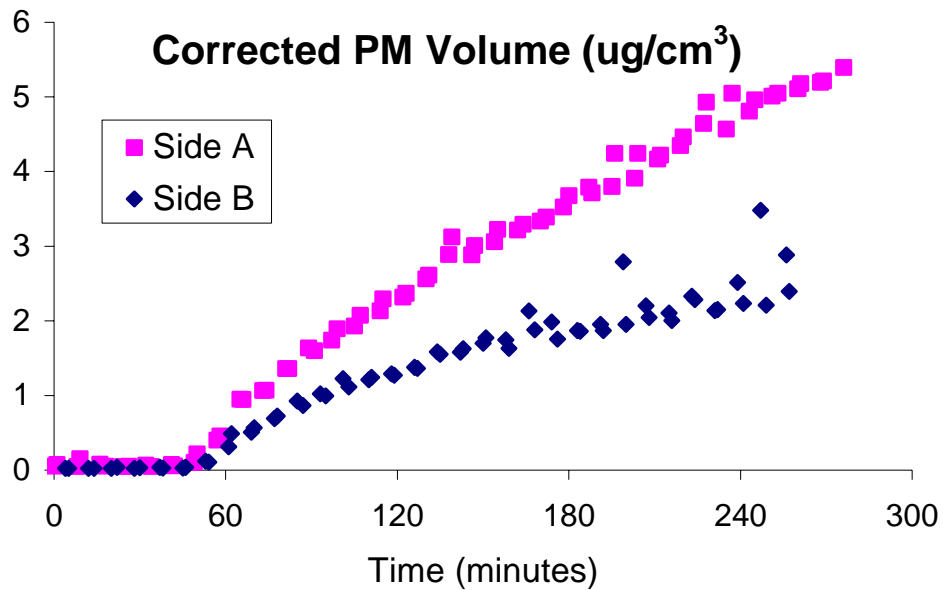
- Some PM data obtained in conjunction with petroleum distillate reactivity study
- The two reactors do not give the same PM results. This is being investigated
- A “chamber model” for PM formation needed

Availability Studies

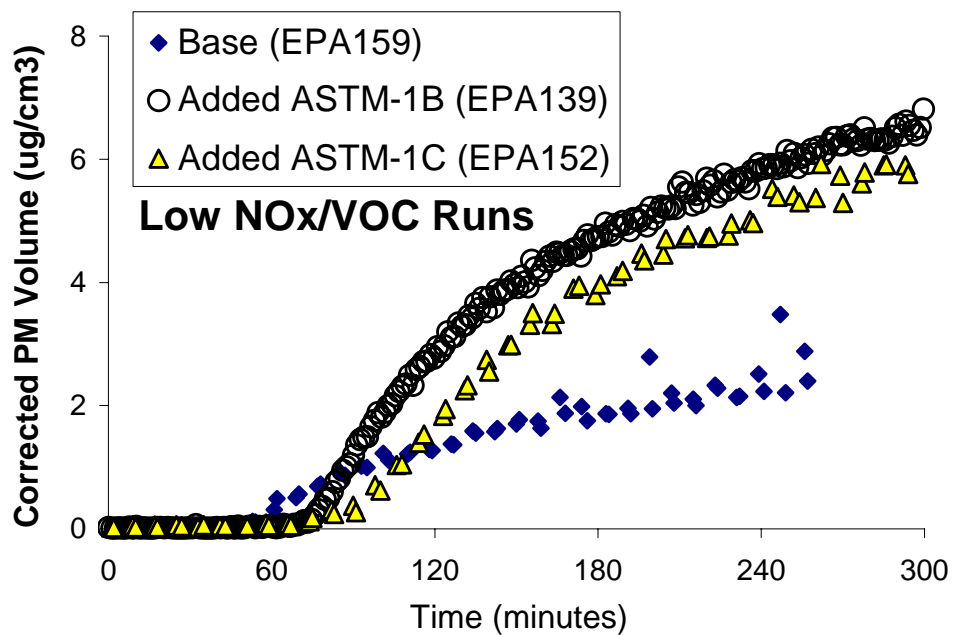
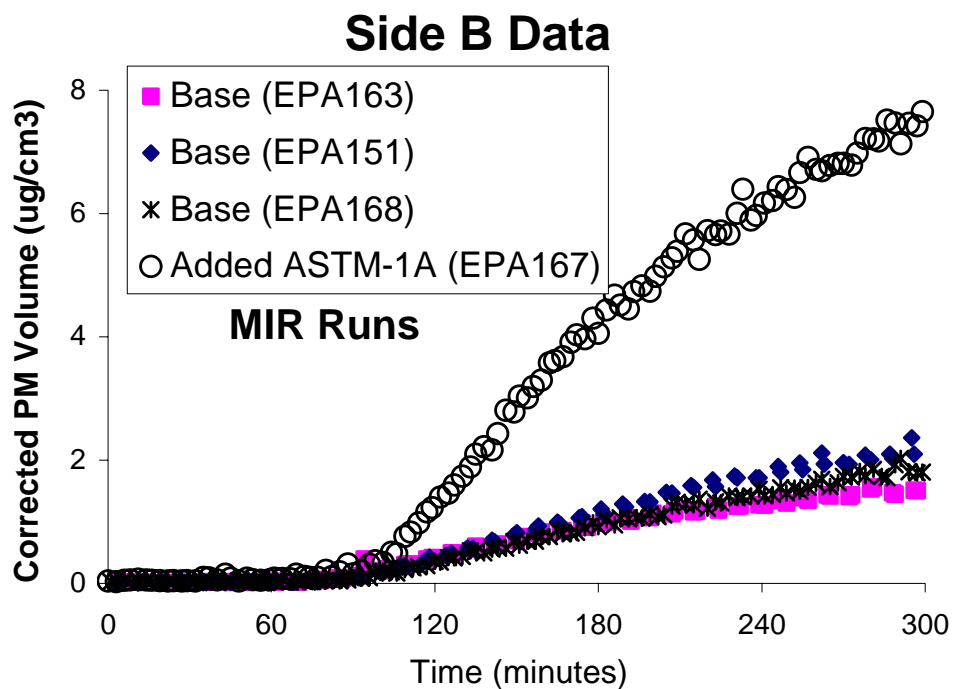
- RRWG projects are currently focused on modeling, not experiments.

PM SIDE INEQUIVALENCY PROBLEM

(Same base case ROG and NO_x mixture on both sides. O₃ and other gas-phase data are same)

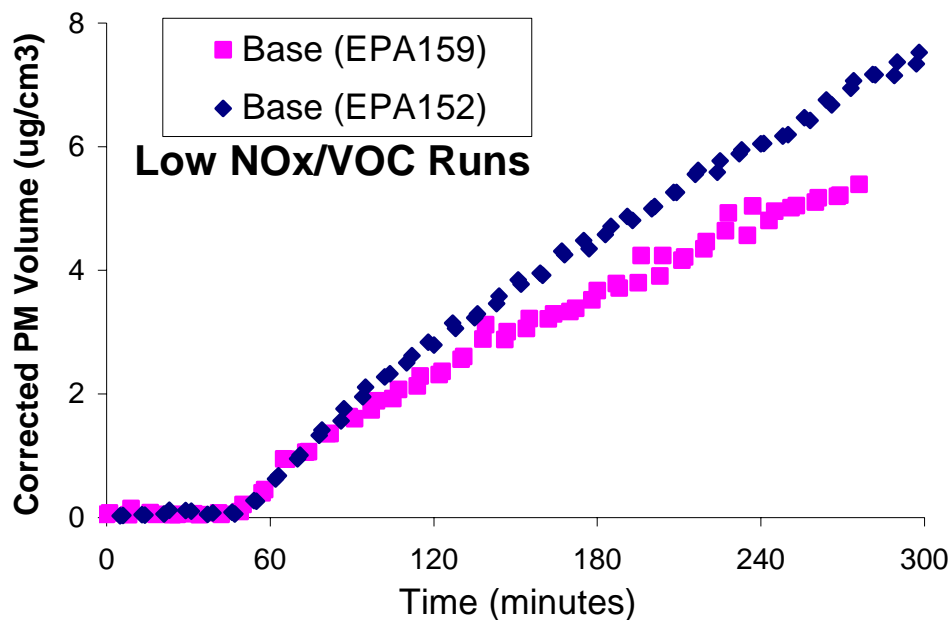
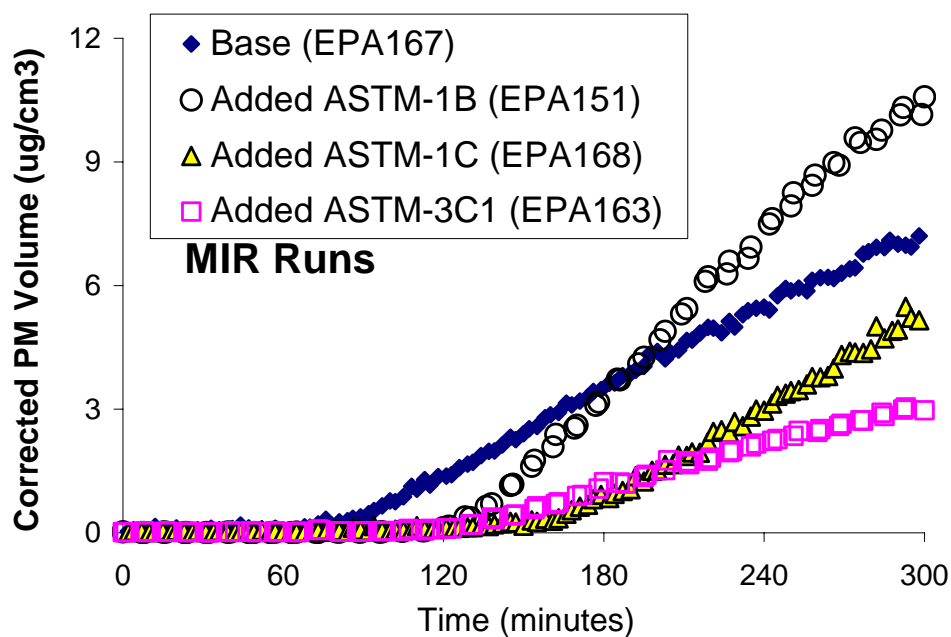


BASE CASE REPRODUCIBILITY AND EFFECTS OF PETROLEUM DISTILLATES



BASE CASE REPRODUCIBILITY AND EFFECTS OF PETROLEUM DISTILLATES

Side A Data



POTENTIAL CANDIDATES FOR SCAQMD COATINGS VOC REACTIVITY PROJECT

(From CARB list)

Ethylene Glycol

- Not studied previously because of volatility and analytical difficulties
- Mechanism not considered uncertain but rate constant not verified

Propylene Glycol

- Studied previously but not using UCR EPA chamber
- Mechanism not considered uncertain and already experimentally verified

Additional Naphtha or Mineral Spirits Solvents (Bin 7 or 10)

- Determination of materials to study should await results of analysis of CARB experiments

POTENTIAL CANDIDATES FOR SCAQMD COATINGS VOC REACTIVITY PROJECT

(From CARB list, continued)

Methanol

- Studied previously but not with full set of base case conditions and with current chambers.
- Mechanism not considered uncertain and probably sufficiently experimentally verified

2-(2-Butoxyethoxy) Ethanol

- No previous chamber studies, but Atkinson et al measured rate constants and major product yields
- Product yields used to refine estimates of SAPRC-99 mechanism generation system
- Mechanism not considered uncertain except perhaps overall nitrate yield

Benzyl Alcohol

- Currently represented using mechanism of toluene, *which is probably incorrect.*
- Most uncertain mechanism of compounds or mixtures listed

POTENTIAL CANDIDATES FOR SCAQMD COATINGS VOC REACTIVITY PROJECT

(From CARB list, continued)

2-Butoxy Ethanol

- Previously studied in chamber experiments
- Atkinson et al measured rate constants and major product yields. Used to refine estimates of SAPRC-99 mechanism generation system
- Nitrate yields measured by Shepson et al. in good agreement with chamber reactivity data.
- Mechanism considered to be well established.

Aromatic 150 (Bin 23)

- Extrapolated mechanisms for high molecular weight aromatics are highly uncertain
- Data will be good complement to study of Aromatics 100 for CARB